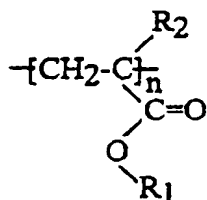


## Claims

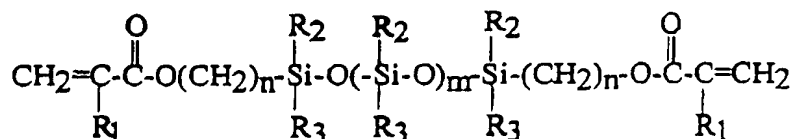
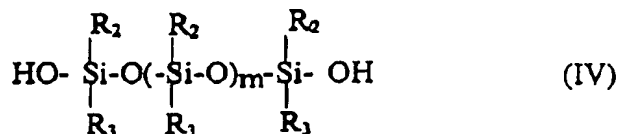
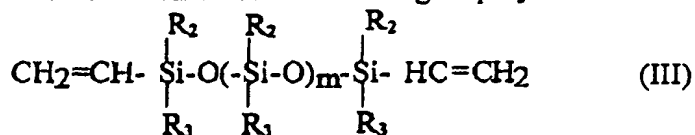
We claim:

- 1) The method and materials to make polymer-based objects, including
  - a) The process, which is the combination of injection, measurable pressure and microwave energy.
  - b) The compositions used in this process and systems.
- 2) The use of said process and system in claim 1) to give high accuracy shape and hardening of polymers and polymer-containing composites.
- 3) The use of a hand-held microwave applicator to harden polymers and polymer-containing composites at the site of application (i.e., intra-oral, orthopedic).
- 4) The compositions of claim 1 wherein said polymer-based materials, which is suitable for denture base, including one component and two component denture base. Two kinds of denture base consist of mono-, di-, tri-, or multifunctional methacrylate polymers or monomers, cross-linking agent, organic pigments or metal oxides, plasticizers and initiators.
- 5) The composition of claim 4 wherein said mono-, di-, tri- or multifunctional methacrylate polymers is within the scope of the general formula:



The  $\text{R}_1$  is hydrogen, alkyl, substituted alkyl group, cyclic hydrocarbon, benzyl, ether, hydroxyalkyl,  $\text{R}_2$  is hydrogen, halogen, alkyl, substituted alkyl group and  $n$  is an integer at least equal to 2.

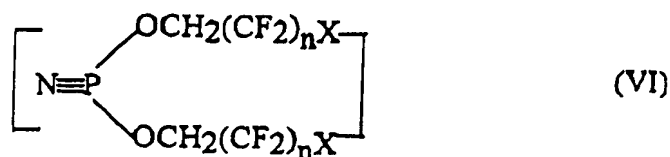
- 6) The composition of claim 1 wherein said polymer-based materials, which is suitable for soft denture and consists of organopolysiloxanes and phosphonitrilic fluoroelastomers.
- 7) The composition of claim 6 wherein said organopolysiloxanes is within the scope of the general formula:



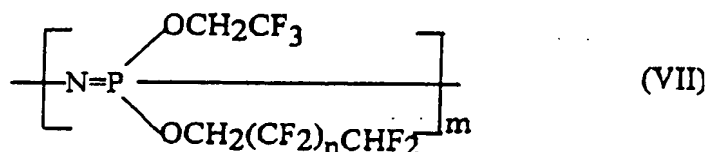
Wherein  $m$  is an integer having a value from 1 to about 6,000;  $n$  is an integer having a value from 1 to 6;  $\text{R}_1$  is hydrogen or alkyl group,  $\text{R}_2$  and  $\text{R}_3$  are alkyl groups having 1 to 6 carbons.

- 8) The composition of claim 6 wherein said phosphonitrilic fluoroelastomers is within the scope of general

formula:



wherein X is H or F, and n is usually from 1 to 11. and



wherein n is 3,5,7,9, or 11, and m is from 10,000 to 50,000.

- 9) The composition in claim 1 wherein said polymer-based materials, which is suitable for use as composite resins, comprised of a polymer matrix, fillers, initiator and coupling agent.
- 10) The composition in claim 9 wherein said polymer matrix is a polymerizable resin suitable for use in the oral environment, which includes 2,2-bis[4-(2-hydroxy-3-methacryloyloxypropoxy)phenyl]propane (BisGMA), ethyleneglycol dimethacrylate (EGDMA) and triethyleneglycol dimethacrylate (TEGDMA), cutectic monomers, hydrophobic monomers, urethane dimethacrylate resins, spiro orthocarbonates, organo-esters of phosphorus.
- 11) The composition in claim 9 wherein said fillers comprise (silica) calcium, strontium, lanthanum, barium, rare earth, alumina, silicate in crystalline, or in aluminosilicate with a zeolite structure, and fluoride of the rare earth metals or mixtures of such fluorides (glass pyrogenically produced, ceramics, zirconium, gold, silver, or silver-tin alloys).
- 12) The weight % of the organic filler, as an overall weight of the composite, being in the range of 30 to 96%, but preferably in the range of 50 to 85%.
- 13) The particle size of fillers in claim 11 ranging from 0.04 micrometers to approximately 10 micrometers, preferably being distributed between 1 and 7 micrometers.
- 14) The composition of claim 9 wherein said initiator comprises microwave sensitive compounds, which include but are not limited to benzoyl peroxide, dilauroyl peroxide, (tert-butyl peroctoate or tert-butyl perbenzoate, 2,4-dichlorobenzoyl peroxide and 4,4'-dechlorobenzoyl peroxide) in the weight range of the composition of 0.05% to 1.0 %, preferably in the range of 0.09 to 0.5%.
- 16) The composition in claim 9 wherein said accelerators include but are not limited to amine accelerators, comprising N, N-diethanol-p-toluidine, or triethylamine.
- 17) The composition in claim 9 wherein said couplers include but are not limited to polyfunctional agents, such as gamma-methoxypropylene silane.
- 18) The composition in claim 17 wherein said coupler contains an Si-O functionality and an ethylenically unsaturated group
- 19) The composition in claim 9 wherein said couplers consist of thiomethacrylates.